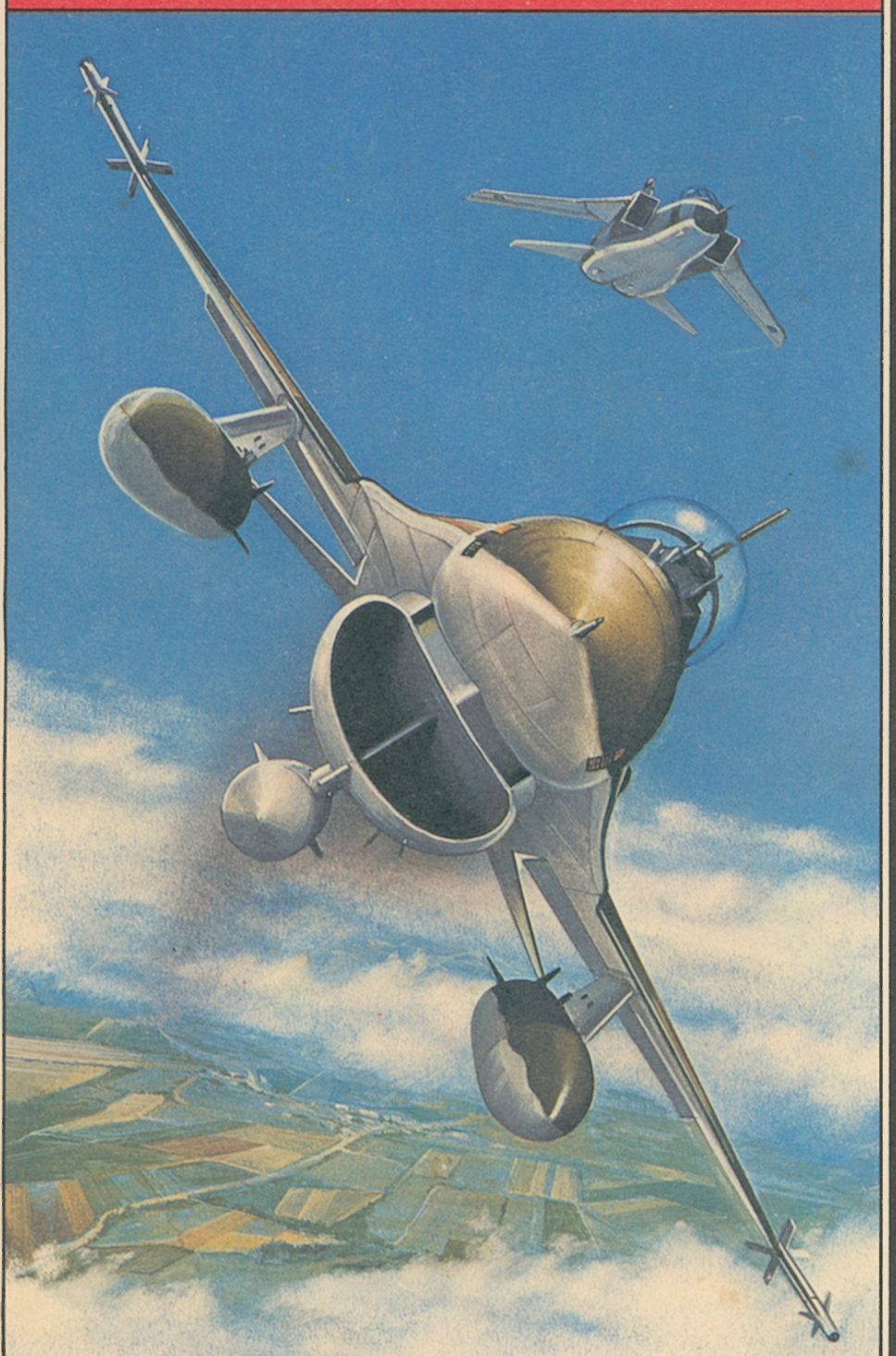
16 · DOMINO · 16

COMBAT AIRCRAFT

The warplanes of the West
Roles – armament – performance
31 aircraft illustrated in colour

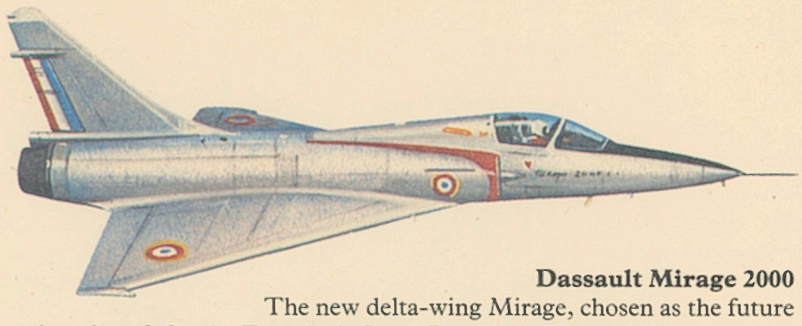


In 1946 the average bomber was a large, lumbering aircraft with a large crew, several of whom operated defensive machine-guns. This concept of a massive aircraft continued into the first jet-powered bombers such as the Boeing B52 and the British Vulcan. But today's bombers are very different – two-seaters with little or no defensive armament, relying on their immense speed to stay clear of ground-to-air missiles and on their terrain-following radar to be able to fly under a defensive radar network. Fighters too have changed from rudimentary jet planes with a top speed of 600mph to a generation just coming into service which fly at Mach 2 (twice the speed of sound, about 1,300mph) as a matter of course. They are equipped with electronic navigation and attack systems, 'avionics', which may cost more than the plane itself and can guide missiles to targets 200 miles away. Some have variable geometry or 'swing wings', which allow the pilot either to fly at very low speeds for take-off and landing or when 'loitering' over enemy territory, or accelerate into a supersonic dash to take a target by surprise.

But the distinction today is not so much between 'fighters' and 'bombers' as between the different roles for which a warplane is designed – ground surface-strike or ground-support, high level supersonic interception, 'air superiority' or dog-fighting at lower speeds and altitudes, reconnaissance, or (which makes an aircraft very costly) a combination of these.

In the forseeable future, missiles are most unlikely to replace manned aircraft. But avionics will certainly become increasingly elaborate, with more automation to help the pilot in seeking targets and intercepting intruders (or avoiding interception). Already 'stand-off' weapons are being developed which can guide themselves automatically to targets hundreds of miles away after being launched from their 'mother' plane; and missiles from fighters can be guided both by airborne and land-based radar and computers. Nations are also increasingly producing new aircraft jointly – both to share the cost and to widen the market for the plane. The Jaguar (Britain/France), Tornado (Britain/West Germany/Italy) and a planned British/French/West German fighter for the 1990s are examples, while the American F16 is also being built in Europe.

Specifications given here for each plane are in very general terms: they can vary widely between different versions of any one aircraft produced for different customers or different roles.
E = engines and their maximum thrust. **A** = armament. **S** = top speed. **CR** = combat radius in miles. **L** and **W** = the length and wingspan to the nearest foot.



Dassault Mirage 2000
The new delta-wing Mirage, chosen as the future combat aircraft for the French air force. It made its first public appearance at the 1978 Farnborough Air Show, with an impressive flying performance. Top speed will probably be around 1,300mph, though no details have yet been released, and it will enter service in the early 1980s.

Painted by Michael Trim – text by Arthur Reed
Devised and produced by Domino Books Ltd.
First published by Fontana Books Ltd. 1979
ISBN 0 00 685456 7
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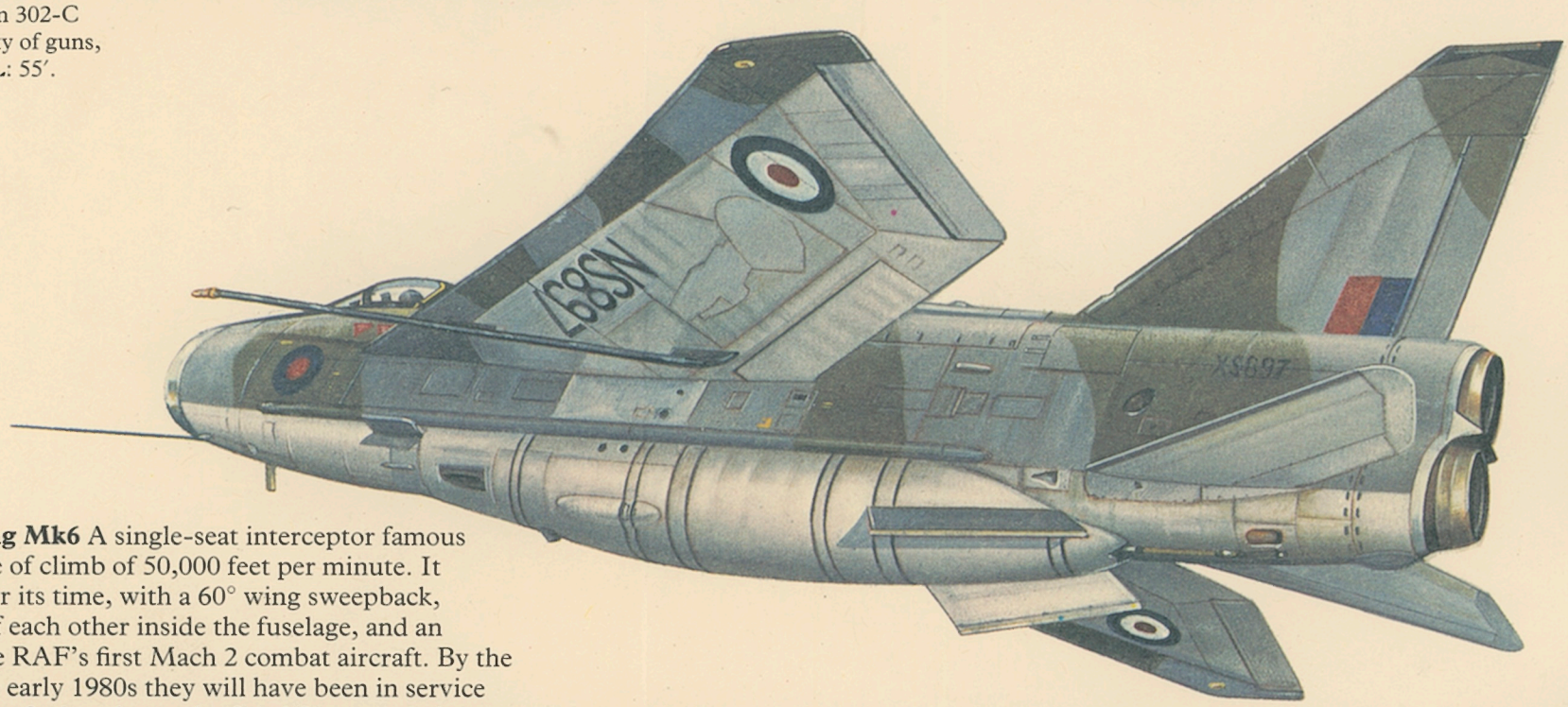
U.S.A.

Lockheed SR-71 Blackbird Fighters and bombers depend on up-to-date information sent back by fast, high-flying reconnaissance aircraft equipped with powerful cameras and electronic devices which can 'read' what the enemy is doing. The most advanced of this breed is the Blackbird, which is able to flash over targets at speeds of up to 2,000mph, making the task of intercepting it very difficult indeed. This sinister-looking plane is crewed by two men who have to wear space-type clothing to protect them against the effects of travelling at the speed of a rifle bullet. In 1964 a Blackbird set a height record of 86,000 feet, and in 1974 crossed the Atlantic in one hour, 55 minutes. It can photograph 60,000 square miles of territory during one hour of flight, uses 8,000 US gallons of fuel specially developed for it an hour, and refuels in-flight. Full details are still on the secret list, but it is thought that only about 20 were produced.
E: two Pratt and Whitney J58 32,500lb turbojets. **A**: Nil. **S**: 2,070mph. **L**: 107′. **W**: 56′.

AIRFORCE ILLUSTRATED:
Italy

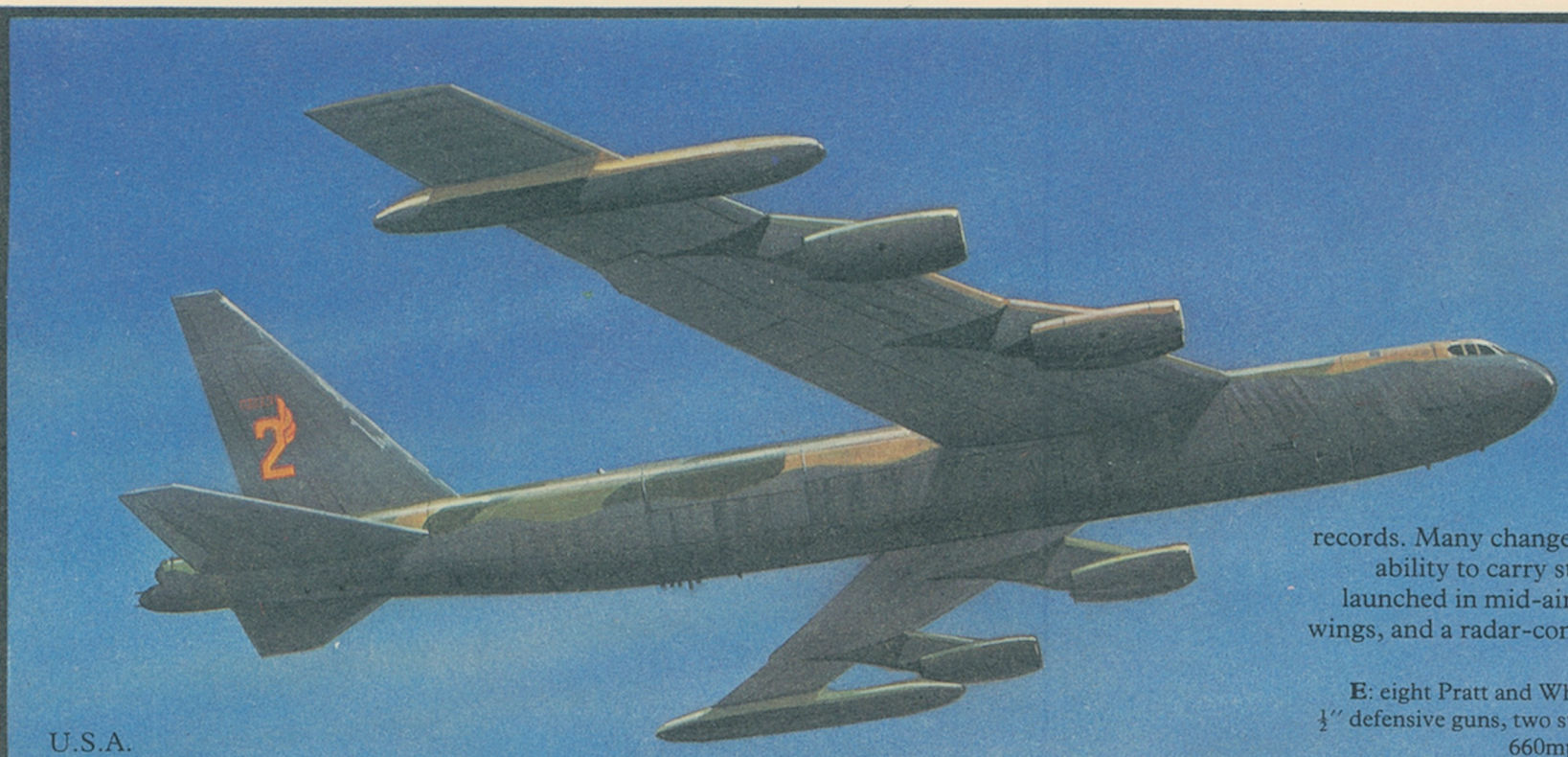
Aeritalia G91Y A single-seat, light tactical fighter-bomber and reconnaissance aircraft developed for the Italian Air Force and delivered from the early 1970s onwards. It is a twin-engined development of the earlier single-engined Fiat G91, which in 1954 had won a NATO competition for a new fighter and had been bought by the Italians, Germans and Portuguese. The cockpit is armoured and fully air-conditioned.
E: two General Electric J85-GE-13A, 4080lb turbojets mounted side-by-side. **A**: two 30mm cannon and 4000lb of ordnance. **S**: 690mph at sea level. **CR**: 466m. **L**: 38′. **W**: 30′.

E: two Rolls-Royce RB 146 Avon 302-C 16,300lb turbojets. **A**: a wide variety of guns, bombs and rockets. **S**: 1,500mph. **L**: 55′. **W**: 35′.



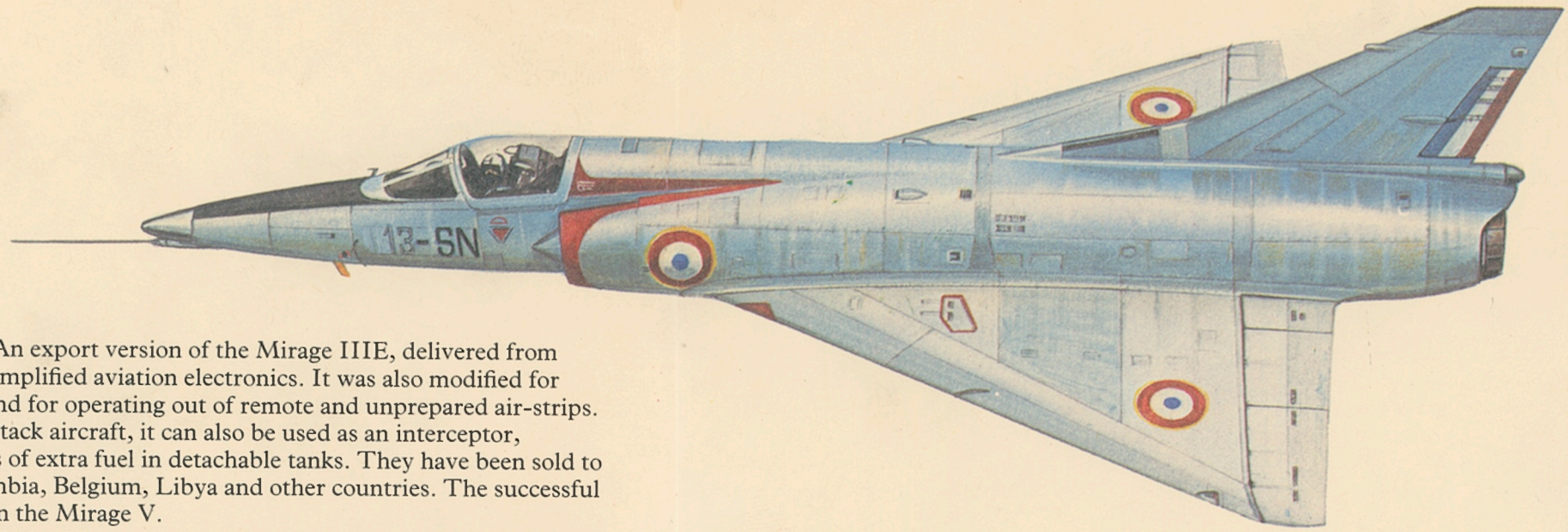
British Aerospace Lightning Mk6 A single-seat interceptor famous for its performance, with a rate of climb of 50,000 feet per minute. It had an unusual specification for its time, with a 60° wing sweepback, two engines mounted on top of each other inside the fuselage, and an all-moving tailplane. It was the RAF's first Mach 2 combat aircraft. By the time they are withdrawn in the early 1980s they will have been in service for 20 years. Overwing auxiliary fuel-tanks can be fitted for extended range.

G.B.



U.S.A.

Boeing B52 Stratofortress The menacing shape of the B52 has been in the sky since 1955 and was for many years America's main nuclear bomber. As long ago as 1962, one flew 12,519 miles non-stop in 22 hours 10 minutes without refuelling, to establish 11 aviation records. Many changes have been made to it, among them the ability to carry stand-off weapons (missiles which can be launched in mid-air and directed to their targets) under the wings, and a radar-controlled defensive gun system in the tail. It has a crew of six.
E: eight Pratt and Whitney J57-P-43W 11,200lb turbojets. **A**: four ½″ defensive guns, two stand-off missiles, up to 60,000lb of bombs. **S**: 660mph at 20,000ft. **CR**: 6,000m. **L**: 158′. **W**: 185′.

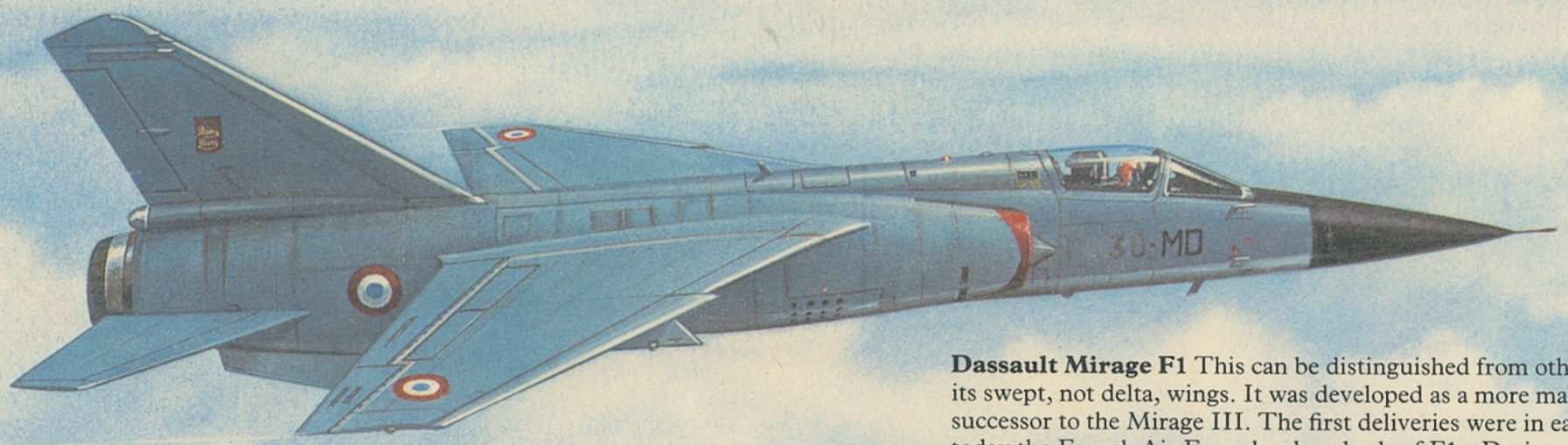


Dassault Mirage 5 An export version of the Mirage IIIE, delivered from 1968 onwards, with simplified aviation electronics. It was also modified for easier maintenance, and for operating out of remote and unprepared air-strips. Primarily a ground-attack aircraft, it can also be used as an interceptor, carrying 1,000 gallons of extra fuel in detachable tanks. They have been sold to Pakistan, Peru, Colombia, Belgium, Libya and other countries. The successful Israeli *Kfir* is based on the Mirage V.

E: one Snecma Atar 9C 13,670lb turbojet. **A**: varies, but for ground-attack is two 30mm cannon, plus two 1000lb bombs. **S**: 1,450mph, at sea level 863mph. **CR**: 800m. **L**: 51′. **W**: 27′.

France

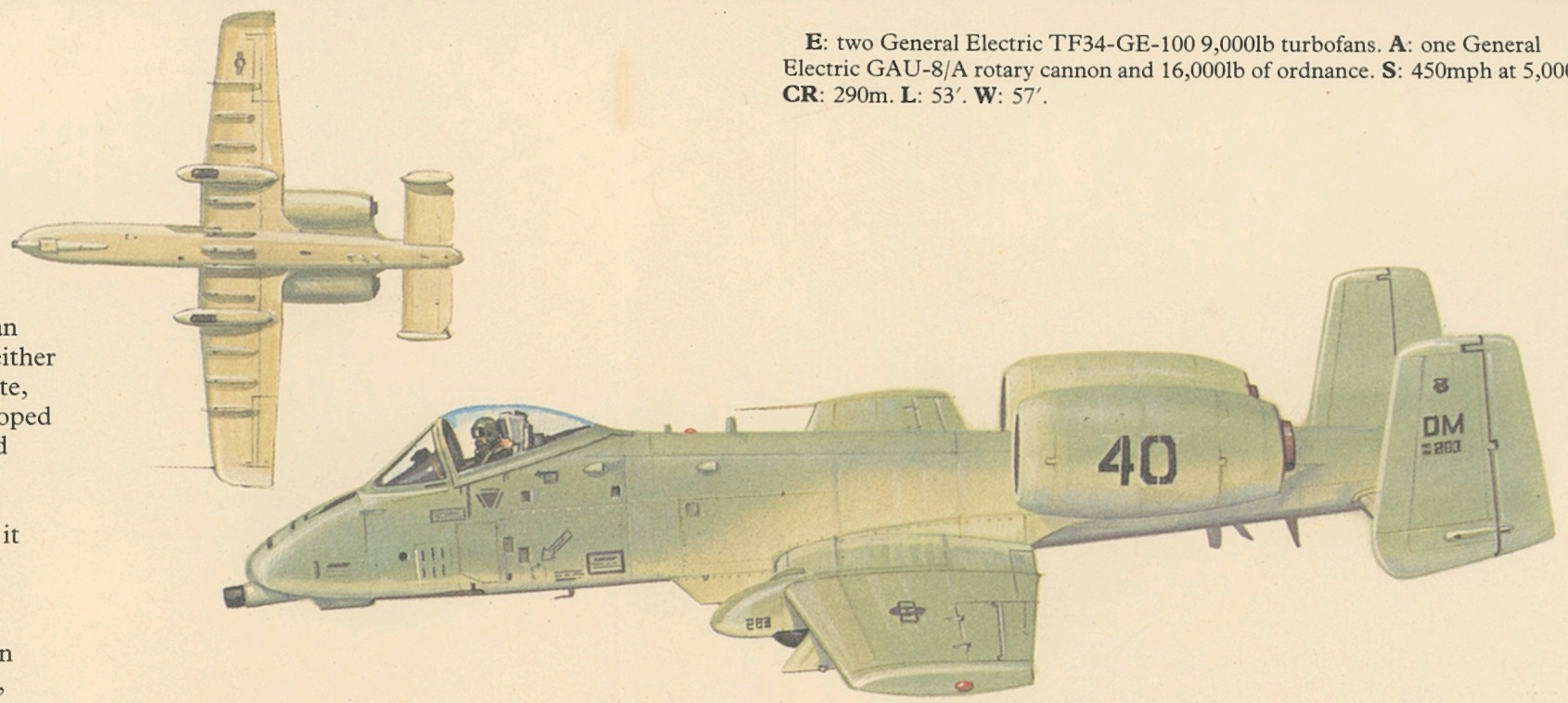
France



E: one Snecma Atar 9K-50 15,785lb turbojet. **A**: two 30mm cannon and four missiles or fourteen 250lb bombs. **S**: 1450mph at 40,000ft. **CR**: 560m. **L**: 49′. **W**: 27′.

Dassault Mirage F1 This can be distinguished from other Mirages by its swept, not delta, wings. It was developed as a more manoeuvrable successor to the Mirage III. The first deliveries were in early 1973, and today the French Air Force has hundreds of F1s. Designed primarily as a high-altitude interceptor, it has also been developed for ground attack and training. It has been sold widely abroad: Spain, Greece, Kuwait, South Africa and Libya are now all using the F1 in its various versions.

E: two General Electric TF34-GE-100 9,000lb turbofans. **A**: one General Electric GAU-8/A rotary cannon and 16,000lb of ordnance. **S**: 450mph at 5,000ft. **CR**: 290m. **L**: 53′. **W**: 57′.



Fairchild A-10A This extraordinary aircraft is in effect a flying howitzer – a plane built around a formidable cannon with seven barrels and an amazing rate of fire. It can fire either 2,100 or 4,200 rounds per minute, as the pilot selects. It was developed specifically as a tank-buster, and for loitering over battlefields. Hence the low top speed and heavily armoured construction: it is designed to withstand a great deal of punishment from anti-aircraft fire and still fly. It was selected in a 'fly-off' competition against an entry from Northrop, and the USAF are taking 773.

U.S.A.

U.S.A.

E: two Pratt and Whitney TF30-P-412A 20,900lb turbofans. **A**: one GE M-61A1 Vulcan 20mm cannon, Phoenix, Sidewinder and Sparrow missiles. **S**: 1,500mph at high altitude. **CR**: 1,000m. **L**: 62′. **W**: 64′ spread; 38′ swept.

Grumman F-14 Tomcat This advanced two-seat interceptor of the US Navy and Iranian Air Force swings its wings automatically in flight to give speeds from 150 to 1,500mph. Its advanced radar and computer pick out from incoming targets the six which form the greatest threat and indicate to the crew which of three types of missiles they should select, and exactly when they should be fired. The missiles can home onto enemy aircraft when they are up to 200 miles away.

E: two Rolls-Royce Spey 101 11,100lb thrust turbofans. **A**: 16,000lb of ordnance, including bombs and Martel guided missiles. **S**: 645mph at 250ft. **CR**: 1,150m. **L**: 63′. **W**: 44′.

British Aerospace (Hawker Siddeley) Buccaneer Buccaneers were originally developed in 1963 for operating off carriers. They were built unusually strongly to withstand the intense buffeting of operations at low level and heavy landings onto aircraft carriers cruising in rough waters. But with the phasing out of carriers they were modified and handed over to the RAF in a version called the S Mk 2B: the first of these flew in 1970, a two-seat strike and reconnaissance aircraft, able to penetrate enemy defences at extremely low level. The Royal Navy is now replacing Buccaneers with the vertical take-off Sea Harrier.

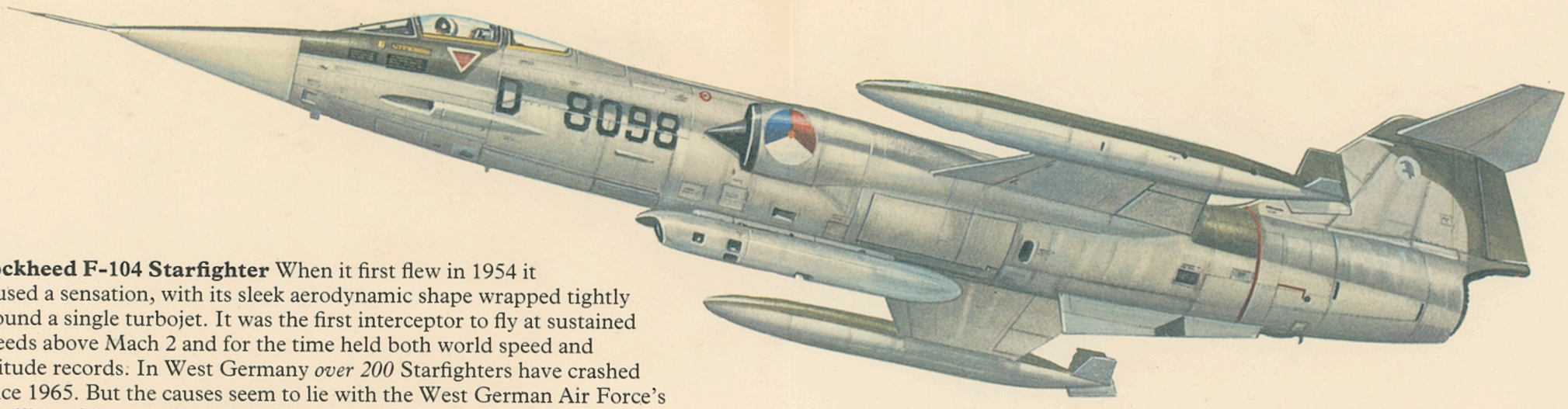
G.B.

G.B.

British Aerospace (Hawker Siddeley) Harrier The world's first vertical take-off fighter, Harriers can take off from the middle of a wood. Swivelling nozzles can direct the blast of its jet engine downwards. To help its performance even further a ski-slope ramp has recently been introduced 20 feet high and 130 feet long which 'throws' the aircraft into the air. British Aerospace are developing a version called the Sea Harrier for use off the Royal Navy's new through-deck cruisers: the first of these flew in summer 1978.

E: one Rolls-Royce Pegasus 103 vectored thrust engine developing 21,500lb. **A**: two 30mm cannon and 5,000lb of ordnance. **S**: 720mph at 1,000ft. **CR**: 200m. **L**: 45′. **W**: 25′.

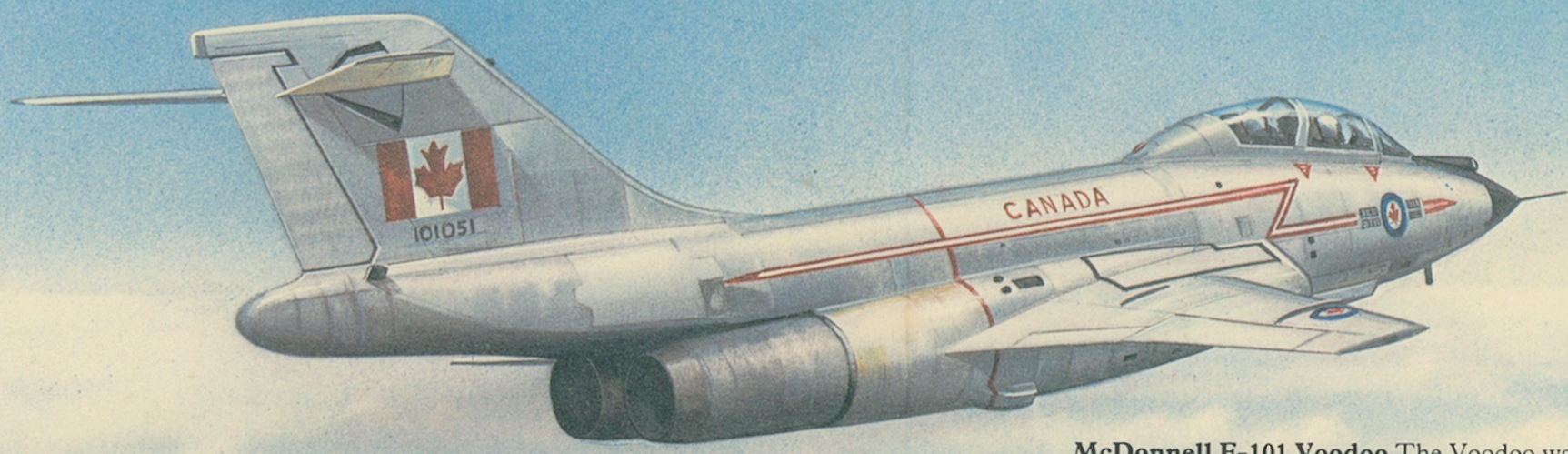
E: one General Electric J79-GE-19 17,900lb turbojet. **A**: one 20mm M-61 rotary cannon, two Sparrow and two Sidewinder missiles. **S**: 1,450mph at 36,000ft. **CR**: 745m. **L**: 55′. **W**: 22′.



Lockheed F-104 Starfighter When it first flew in 1954 it caused a sensation, with its sleek aerodynamic shape wrapped tightly around a single turbojet. It was the first interceptor to fly at sustained speeds above Mach 2 and for the time held both world speed and altitude records. In West Germany *over 200* Starfighters have crashed since 1965. But the causes seem to lie with the West German Air Force's handling of this very sophisticated aircraft: several other air forces operate it with a normal safety record.

Netherlands

Canada



McDonnell F-101 Voodoo The Voodoo was originally developed in the 1950s as a long-range escort and penetration fighter. It was the heaviest single-seat fighter ever accepted by the US Air Force. A special feature was its great range – up to 2,800 miles – using fuel from fuselage tanks and three more carried under the fuselage. A two-seat version was adopted by the US Air Defence Command and the Canadian Armed Forces.

E: two Pratt and Whitney J57-P-13 or J57-P-55 14,500lb turbojets. **A**: three Falcon missiles, two Genie missiles, four 20mm cannon. **S**: 1,220mph at 40,000ft. **CR**: 750m. **L**: 67′. **W**: 40′.

U.S.A.

McDonnell Douglas F-15 Eagle A handsome, expensive, high performance single-seater, one of a new generation of American fighters born in the 1970s. Lightweight, very fast and manoeuvrable, the Eagle is a formidable air-superiority machine. The US Air Force are taking over 700 and 25 have been sold to Israel. The range can be stretched to 3,450 miles using 'clip-on' auxiliary tanks. There is also a two-seat trainer version, the TF-15A.

E: two Pratt and Whitney F100-PW-100 25,000lb turbofans. **A**: one 20mm M-61A-1 rotary cannon, four Sidewinder and four Sparrow missiles; up to 12,000lb of ordnance. **S**: 1,650mph. **CR**: 1,000m. **L**: 64′. **W**: 43′.

Northrop F-5 In 1963 the US Defense Department chose the F-5 or 'Freedom Fighter' for delivery to a number of air forces under a Military Aid Programme. Several improved versions were produced and in 1972 one was again chosen against strong competition. This was the F-5E Tiger II, with a more powerful engine, air interception radar, and wing-tip missiles instead of the 'coke-bottle' fuel tanks. Over 1,000 Freedom Fighters were made in America, Canada and Spain, and Tiger IIs are being built in similar numbers. Altogether F-5s have been supplied to some 20 countries from Taiwan to Brazil.
(Tiger II) E: two General Electric J85-GE-21 5,000lb turbofans. **A**: two 20mm M-39 cannon, two wingtip-mounted Sidewinder missiles, plus 7,000lb of ordnance. **S**: 1,055mph at 40,000ft. **CR**: 875m. **L**: 48′. **W**: 27′.

McDonnell Douglas F-18 Hornet America's newest strike fighter has been developed jointly by McDonnell Douglas and Northrop. Over 800 have been ordered by the US Navy to replace the F-4 Phantom and the A-7 Corsair and the first Hornet was rolled out of the factory in September 1978. The total cost of the development programme is expected to be in the region of $133 million, including work on the General Electric engine.

E: two General Electric F404-GE-400 16,000lb low-bypass turbojets. **A**: one 20mm cannon. radar-guided and heat-seeking missiles (total ordnance load 19,000lb). **S**: thought to be around 1,300mph, just under Mach 2. **CR**: 500m approx. **L**: 56′. **W**: 37′.

U.S.A.

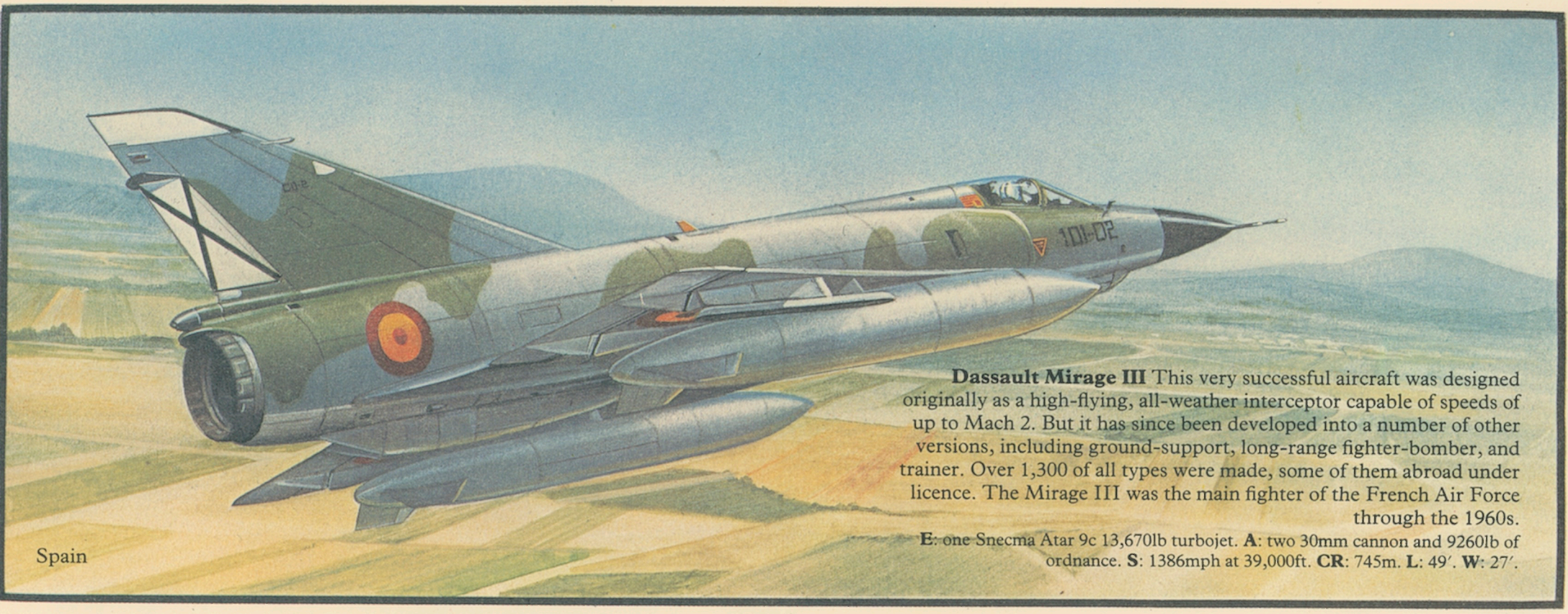
E: two turbo-Union RB 199-34R-2 14,500lb turbofans. **A**: two 27mm Mauser cannon and a wide variety of missiles and bombs. **S**: 1,320 mph at 36,000ft. **CR**: 450–750m. **L**: 56′. **W**: 46′ spread; 28′ swept.

Panavia Tornado At great expense, Britain, West Germany and Italy have jointly developed this swing-wing two-seat fighter for a variety of roles from battlefield strike to interception and reconnaissance. Production has been set up in each of the partner countries and 800 aircraft will be made to start with, the first going into service in early 1980s. The RAF is having a special interceptor version tailored for defence of the British Isles.

Dassault-Breguet Super Etendard A single-seat strike fighter designed for use aboard French aircraft carriers. It was developed from the Etendard IV-M, which had served with the French Navy from 1962. It has an enlarged nose to carry modern radar, a powerful and accurate navigation/attack system, and can be refuelled in flight. It first flew in October 1974.

E: one Snecma Atar 8K-50 11,025lb turbojet. **A**: two 30mm cannon and a variety of bombs and missiles. **S**: 745mph at sea level. **CR**: 225m. **L**: 47′. **W**: 31′.

France

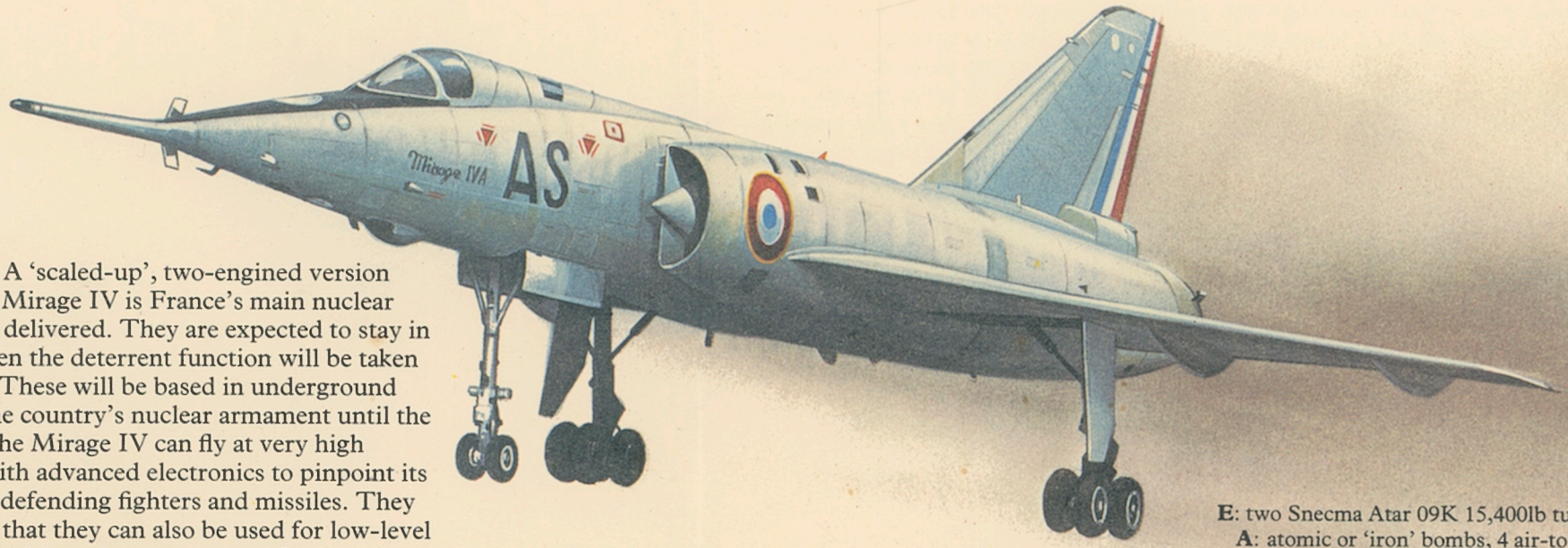


Dassault Mirage III This very successful aircraft was designed originally as a high-flying, all-weather interceptor capable of speeds of up to Mach 2. But it has since been developed into a number of other versions, including ground-support, long-range fighter-bomber, and trainer. Over 1,300 of all types were made, some of them abroad under licence. The Mirage III was the main fighter of the French Air Force through the 1960s.

E: one Snecma Atar 9c 13,670lb turbojet. **A**: two 30mm cannon and 9260lb of ordnance. **S**: 1386mph at 39,000ft. **CR**: 745m. **L**: 49′. **W**: 27′.

Spain

France



Dassault Mirage IV A 'scaled-up', two-engined version of the Mirage III, the Mirage IV is France's main nuclear bomber: 50 have been delivered. They are expected to stay in service until 1985, when the deterrent function will be taken over by S-3 missiles. (These will be based in underground 'silos' and will form the country's nuclear armament until the end of the century.) The Mirage IV can fly at very high altitude and is fitted with advanced electronics to pinpoint its targets and to confuse defending fighters and missiles. They have been modified so that they can also be used for low-level attack, and twelve aircraft have been converted for long-range reconnaissance duties.

E: two Snecma Atar 09K 15,400lb turbojets. **A**: atomic or 'iron' bombs, 4 air-to-surface missiles. **S**: 1450mph at 36,000ft. **CR**: 770m. **L**: 77′. **W**: 39′.

General Dynamics F-16 Small, light, manoeuvrable, highly sophisticated yet relatively cheap, the F16 was selected by four NATO nations (Netherlands, Belgium, Denmark and Norway) in what became known as the fighter sale of the century. It will be in service until, and probably beyond, the year 2000. 348 are on order in Europe, the US Air Force is buying 650, and further sales are expected around the world. It is an extremely nimble fighter, and can climb at a rate of 62,000 feet per minute. Those for the European NATO countries are being produced in Europe.

E: one Pratt and Whitney F100-PW-100 25,000lb turbofan. **A**: one 20mm multi-barrel cannon and 15,200lb of ordnance. **S**: 1,300mph plus at 40,000ft. **CR**: 550m. **L**: 46′. **W**: 31′.

Belgium

E: two Pratt and Whitney TF30-P-3 18,500lb turbofans. **A**: one multi-barrel 20mm cannon, and a large load of ordnance externally – up to fifty 750lb bombs on short-range missions. **S**: 1,650mph at 40,000ft. **CR**: 1,250m. **L**: 73′. **W**: 63′ spread; 32′ swept.

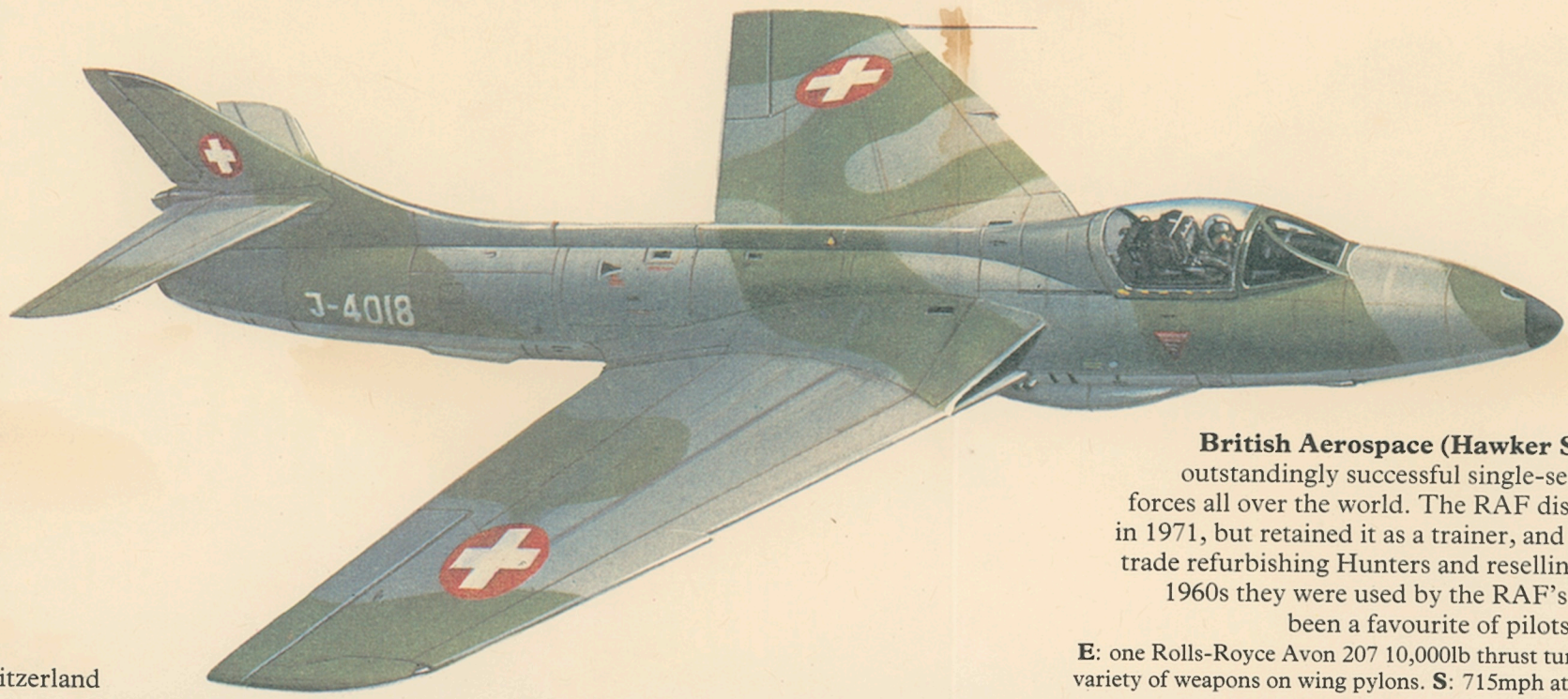
General Dynamics F-111 A bomber designed to hit targets deep inside enemy territory after intruding at low level: it has terrain-following radar which automatically lifts the aircraft over obstacles. The two pilots sit in a capsule-like cockpit which can be blown clear on its own parachute in an emergency. Introduced in 1967 this was the world's first variable geometry or 'swing-wing' combat aircraft. It has since been constantly modified and a new version is being developed by Grumman to jam enemy radar.

U.S.A.

Grumman A-6E Intruder A two-seat, shipborne, low-level strike aircraft, which is constantly being updated with the latest electronics navigation and attack systems. The US Navy and the US Marine Corps now have over 400. They are produced in several forms, including the KA-6D tanker, and the EA-6B 'Prowler'. This has two additional crew to operate the sophisticated electronics which 'sniff out' an approaching enemy.

E: two Pratt and Whitney J52-P-8A/B 9,300lb turbojets. **A**: (A 6E version) Up to 19,000lb of weapons including air-to-surface missiles or in the close-support role, up to 81 small bombs. **S**: 654mph. **CR**: 1,150m. **L**: 55′. **W**: 53′.

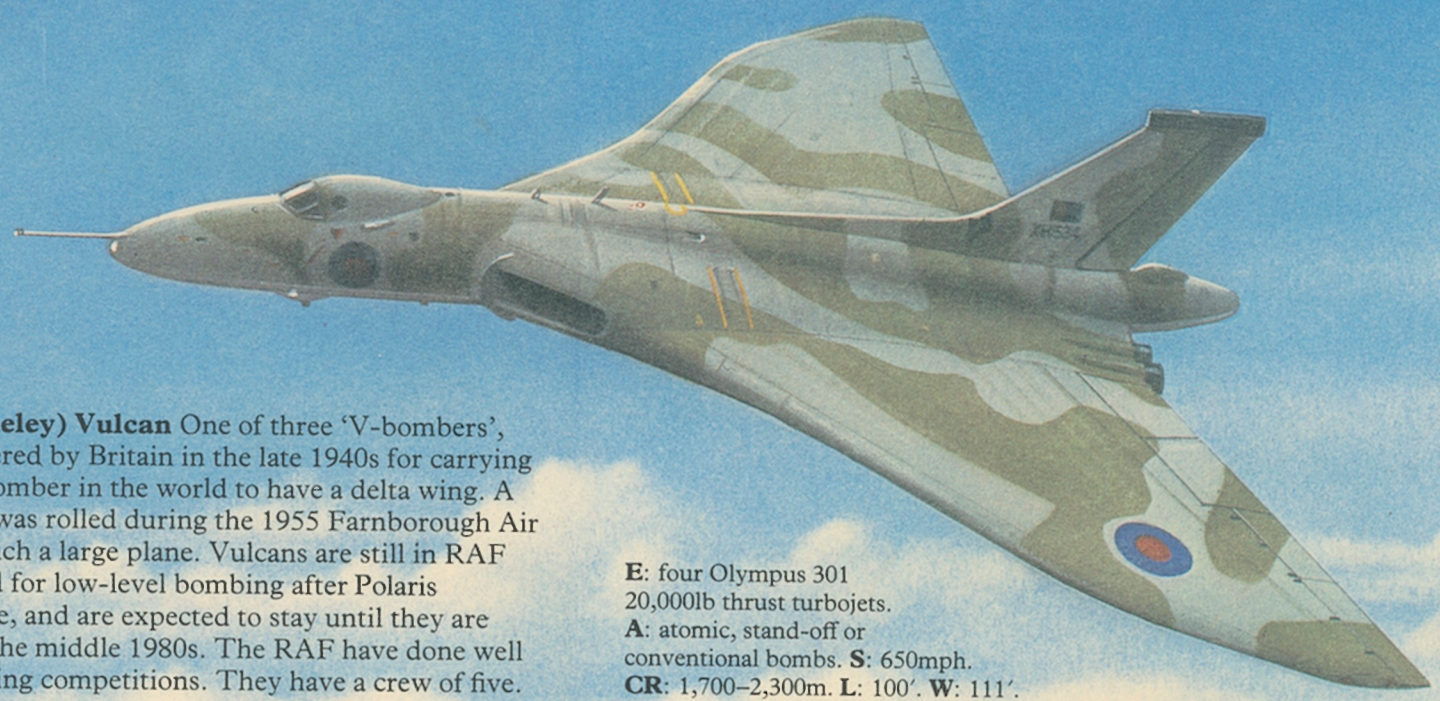
U.S.A.



Switzerland

British Aerospace (Hawker Siddeley) Hunter In its time an outstandingly successful single-seat, subsonic fighter, selling to air forces all over the world. The RAF disbanded its last Hunter squadron in 1971, but retained it as a trainer, and British Aerospace still do a busy trade refurbishing Hunters and reselling them abroad. In the 1950s and 1960s they were used by the RAF's aerobatic team, and have always been a favourite of pilots who had the chance to fly them.

E: one Rolls-Royce Avon 207 10,000lb thrust turbojet. **A**: four Aden guns and a wide variety of weapons on wing pylons. **S**: 715mph at sea level. **CR**: 350m. **L**: 46′. **W**: 34′.

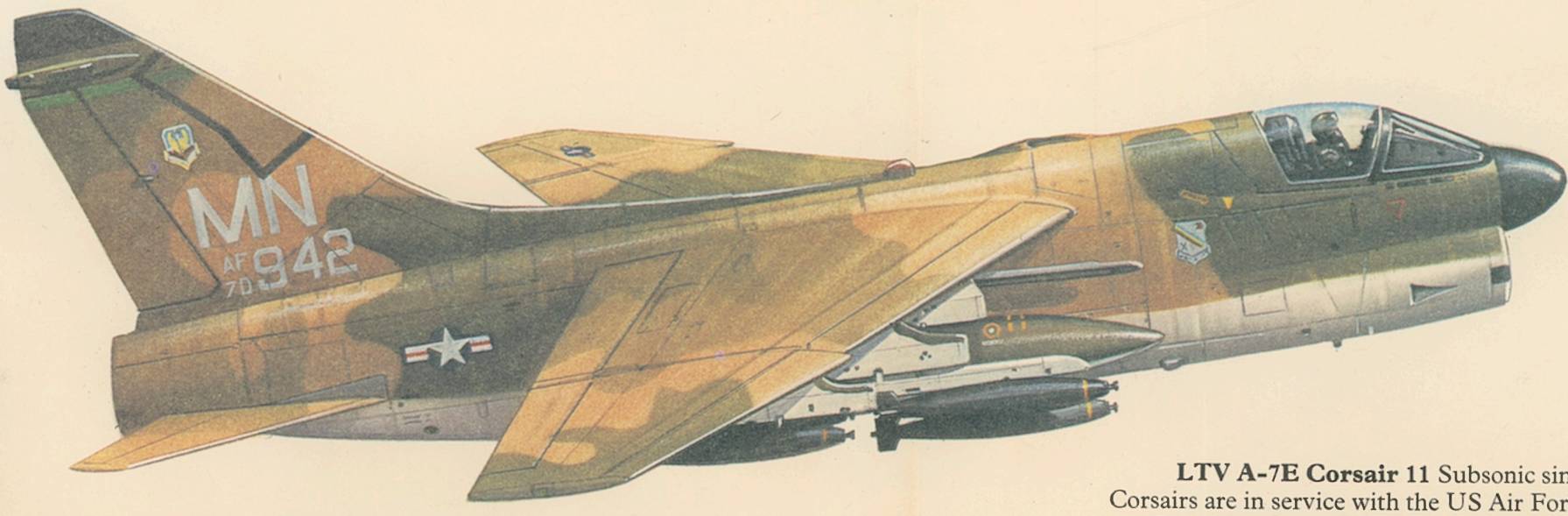


British Aerospace (Hawker Siddeley) Vulcan One of three 'V-bombers', with the Victor and the Valiant, ordered by Britain in the late 1940s for carrying nuclear bombs. It was the first big bomber in the world to have a delta wing. A prototype flew in 1952, and another was rolled during the 1955 Farnborough Air Show – an unusual manoeuvre for such a large plane. Vulcans are still in RAF service although they were converted for low-level bombing after Polaris submarines took over the nuclear role, and are expected to stay until they are eventually replaced by Tornados in the middle 1980s. The RAF have done well using Vulcans in international bombing competitions. They have a crew of five.

E: four Olympus 301 20,000lb thrust turbojets. **A**: atomic, stand-off or conventional bombs. **S**: 650mph. **CR**: 1,700–2,300m. **L**: 100′. **W**: 111′.

G.B.

U.S.A.



E: one Allison TF41A-2 turbofan (based on the Rolls-Royce Spey) 15,000lb thrust. **A**: one 20mm M-61A-1 rotary cannon and 15,000lb of ordnance. **S**: 699mph at sea level. **CR**: 700m. **L**: 46′. **W**: 39′.

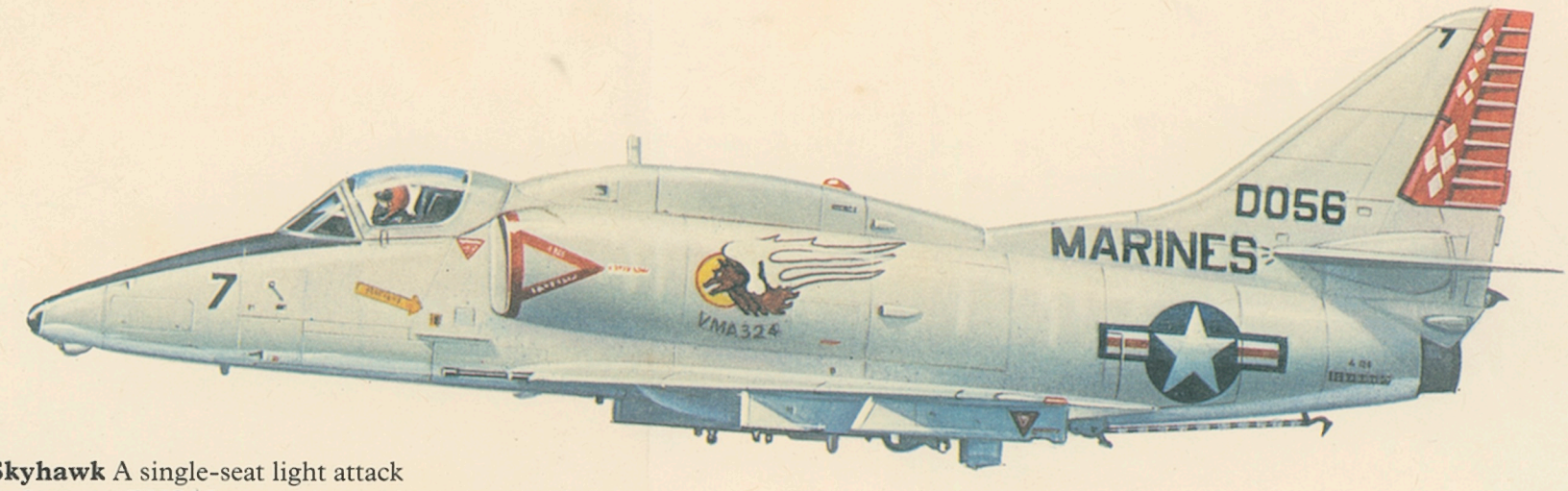
LTV A-7E Corsair 11 Subsonic single-seat tactical fighters, Corsairs are in service with the US Air Force, the US Navy and the Greek Air Force. During the Vietnam war they operated off US aircraft carriers sailing near the coast. Several versions have been produced, the latest being this A-7E, of which 706 have been ordered by the US Navy.

W. Germany

E: two General Electric J79-GE-17 17,900lb turbojets (different engine types are used in other models). **A**: Varies widely, but can include up to ten missiles and a 20mm rotary cannon. **S**: 1,500mph at 40,000ft. **CR**: 900m. **L**: 63′. **W**: 38′.

McDonnell Douglas F-4 Phantom II One of the most successful military aircraft ever, around 5,000 Phantoms have now been sold to forces all over the world. 128 were built in Japan. The Phantom is a very powerful, rather ugly, two-seater and is equally at home as a land-based or carrier-borne aircraft. Those bought for the RAF and the Royal Navy were re-engined with Rolls-Royce Spey engines. The RN have now handed their Phantoms over to the RAF with the phasing out of British aircraft carriers.

U.S.A.



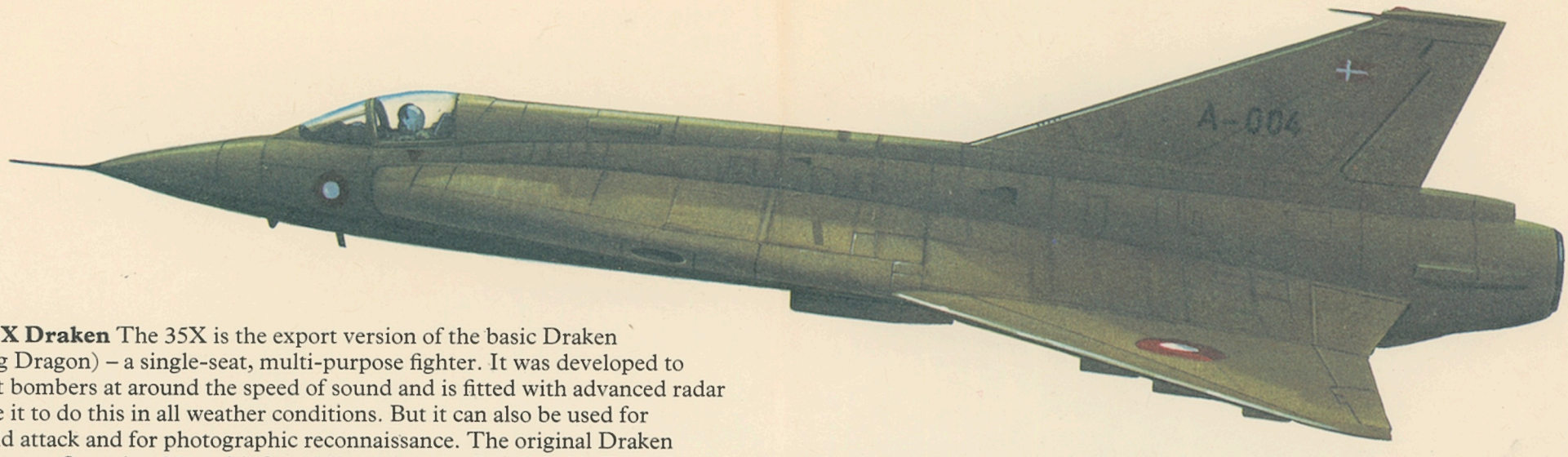
McDonnell Douglas A-4N Skyhawk A single-seat light attack bomber, developed in the 1950s for use off US Navy carriers and now operated in an improved form by the US Marine Corps, Israel and Kuwait, Singapore, Argentina, Australia and New Zealand. The new version, which first flew in 1972, has a revised cockpit layout and updated navigation/attack electronics, and the distinctive 'hump-back'.

E: one Pratt and Whitney J52-P-408A 11,200lb turbojet. **A**: two 30mm DEFA cannon and 8,200lb of ordnance on hard points on the wing and fuselage. **S**: 685mph at sea level. **CR**: 335m. **L**: 40′. **W**: 27′.

Finland

E: one Tumansky R13 14,550lb thrust turbojet. **A**: twin-barrel 23mm cannon and a wide range of rockets and bombs on underwing pylons. **S**: 1,400mph at 36,000ft. **CR**: 350m. **L**: 52′. **W**: 23′.

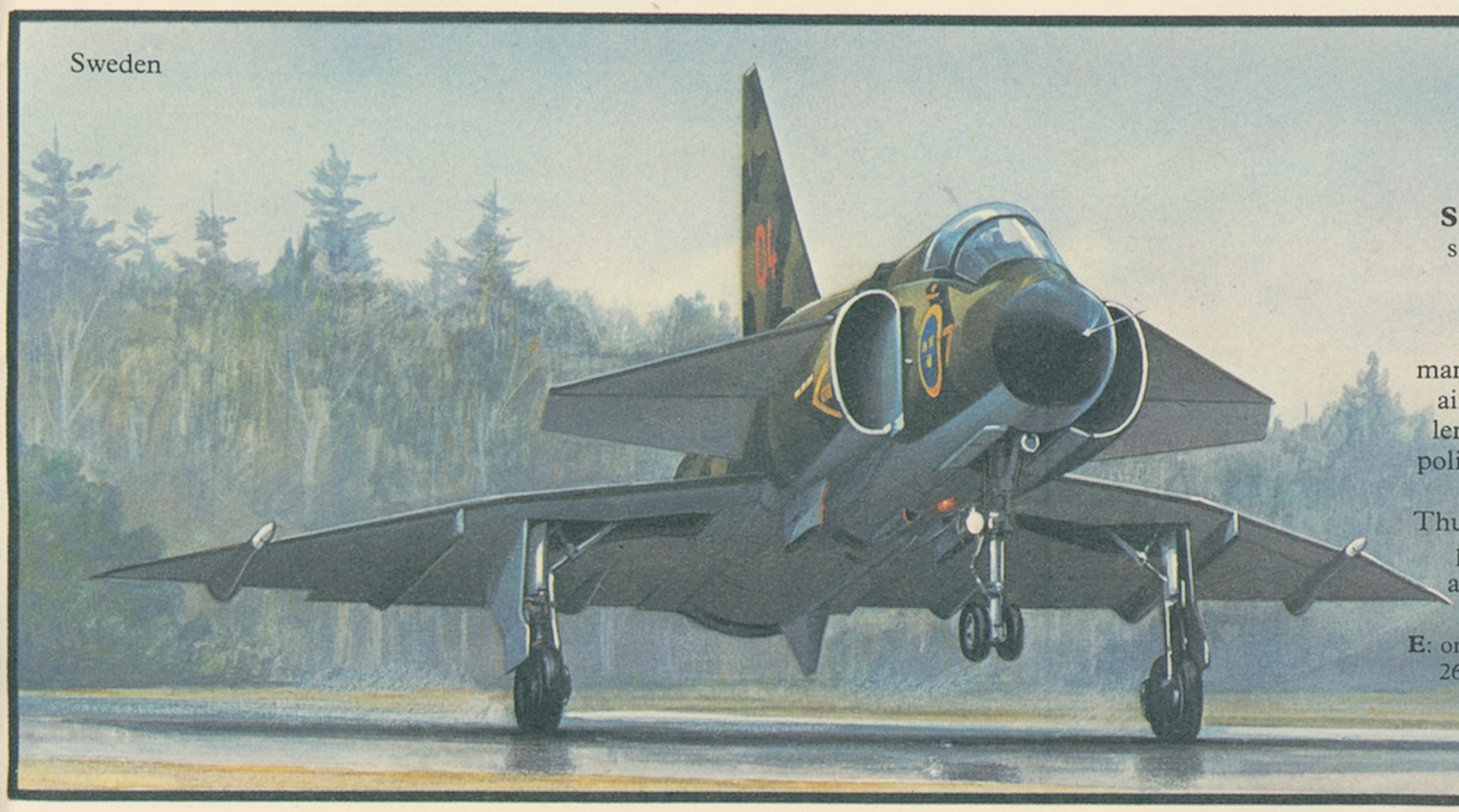
Mikoyan Mig 21 The Soviet Mig 21 (NATO code 'Fishbed-K') is operated by Finland, Egypt and India (where a version is built under licence) as well as by the USSR and many of her allies. It is one of the most effective fighter planes ever designed: small, lightweight and simple yet with outstanding speed and manoeuvrability. It held the world records for speed in 1959 and height in 1962, and the Vietnam War was able even to outmanoeuvre Sidewinder missiles. Since its introduction it has been constantly updated in both performance and armament.



Saab 35X Draken The 35X is the export version of the basic Draken (meaning Dragon) – a single-seat, multi-purpose fighter. It was developed to intercept bombers at around the speed of sound and is fitted with advanced radar to enable it to do this in all weather conditions. But it can also be used for battlefield attack and for photographic reconnaissance. The original Draken prototype was flown in 1961, with first deliveries to the Swedish Air Force in 1965. The 35X has also been ordered by Finland.

E: one Swedish version of the Rolls-Royce RB 146 Mark 60 Avon 17,260lb turbofan. **A**: two 30mm Aden cannon and up to 9,000lb or ordnance. **S**: 1,320mph at high altitude. **CR**: 395m. **L**: 50′. **W**: 31′.

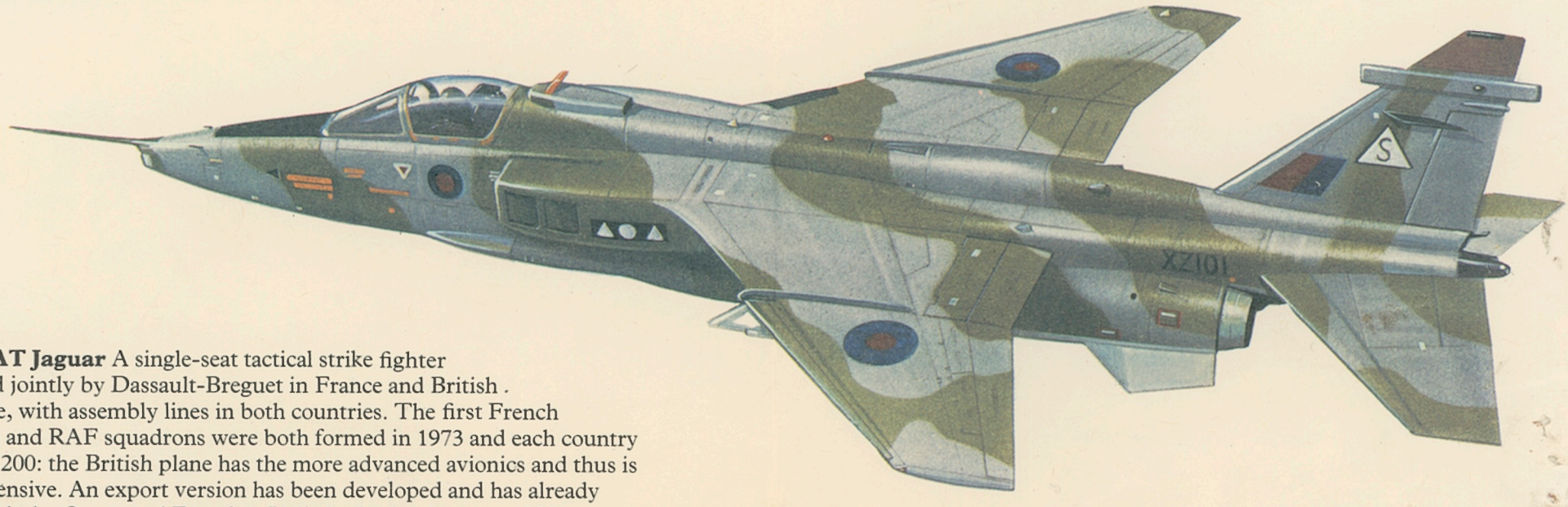
Sweden



Saab 37 Viggen This powerful-looking Swedish single-seat, multi-purpose fighter – the Draken's successor, and in service with the Swedish Air Force since 1971 – has the unusual feature of a canard, or foreplane wing, giving it high manoeuvrability in dog-fighting. It also enables the aircraft to take-off and land on an unusually short length of runway – or road, following the Swedes' policy of being able to disperse their airforce at will throughout the country. The Viggen (meaning Thunderbolt) carries all its weapons slung on seven points beneath the wings and fuselage. It can be adapted to fulfil four roles – attack, interception, reconnaissance and training.

E: one Swedish version of the Pratt and Whitney JT8D-22 26,015lb turbofan. **A**: one 30mm Oerlikon cannon and a wide range of ordnance. **S**: 1,300mph at 36,000ft. **CR**: 620m. **L**: 53′. **W**: 35′.

E: two Rolls-Royce/Turbomeca RT172 Adour 102 7,305lb turbofans. **A**: two 30mm Aden cannon and up to 10,000lb of ordnance. **S**: 990mph at 36,000ft. **CR**: 500m. **L**: 51′. **W**: 28′.



SEPECAT Jaguar A single-seat tactical strike fighter developed jointly by Dassault-Breguet in France and British Aerospace, with assembly lines in both countries. The first French Air Force and RAF squadrons were both formed in 1973 and each country is buying 200: the British plane has the more advanced avionics and thus is more expensive. An export version has been developed and has already been bought by Oman and Ecuador. India is also buying up to 200 Jaguars and will establish a production line of its own.

G.B.

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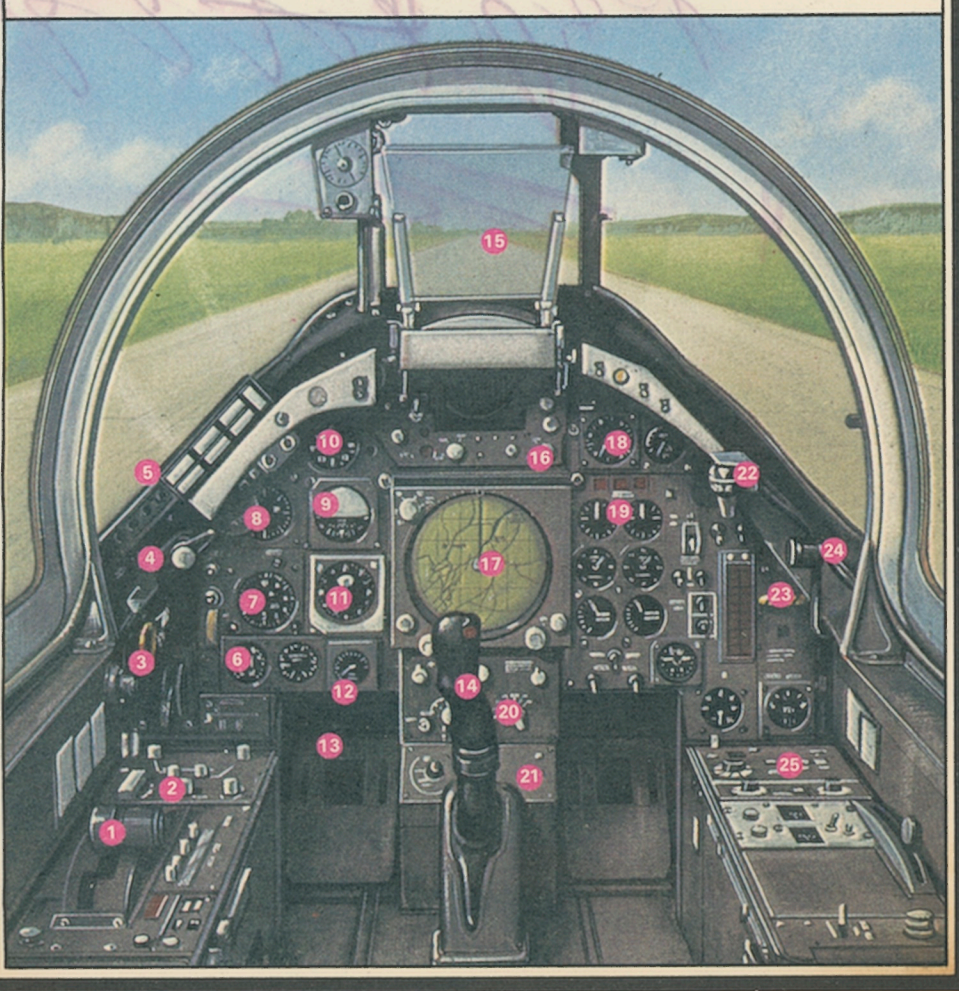
COMBAT AIRCRAFT

THE MEN who fly combat aircraft today are usually very young and always very fit. They are also very highly trained – not only in flying their fast and powerful machines but in mathematics, physics, navigation, electronics and in the complex weapons systems in their charge. It can take up to half a million pounds to train a fighter pilot throughout his flying career, which will last on average about 12 years. He has to go on frequent refresher courses, and each time he transfers from one type of aircraft to another there will be another period of training and more exams to pass. Like civil pilots, he has to undergo regular medical examinations, failure of which means the loss of his licence. And in all air forces, there is a very much higher accident rate than in civil aviation.

The pilot's working quarters are both cramped and crammed with instruments; and since a tired pilot is a dangerous one they often have a great deal of say in how the cockpit of a new aircraft should be laid out by the manufacturers. The cockpit below incorporates features to be found in a typical modern one-seat fighter.

1 Throttles
2 Radio controls
3 Undercarriage controls
4 Braking parachute release
5 Weapons aiming selector panel
6 Vertical speed indicator
7 Altimeter
8 Combined speed indicator
9 Attitude indicator
10 Turn and slip indicator
11 Horizontal situation indicator
12 Radar altimeter
13 Rudder pedals
14 Control column or 'yoke'
15 Head-up display unit
16 Controls for head-up display
17 Moving map display
18 Fuel flow gauge
19 Engine performance gauges
20 Navigation controls
21 Fuel controls
22 Standby compass
23 Parking brake
24 Canopy locking handle
25 Weapons panel



U.K. 85p

ISBN 0 00 685456 7

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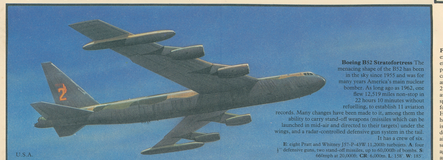
COMBAT AIRCRAFT

The warplanes of the West
Roles – armament – performance
31 aircraft illustrated in colour

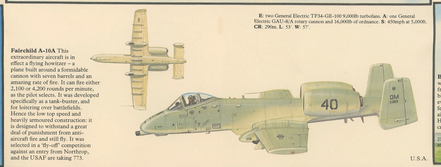
AIRFRAME ILLUSTRATED
Italy

Aeritalia G91Y A single-seat, light tactical fighter-bomber and reconnaissance aircraft developed for the Italian Air Force and delivered from the early 1970s onwards. It is a twin-engined development of the successful single-engined G91 which won the NATO Light Fighter (NLF) competition for a new fighter and had been bought by the Italian, Germany and Portuguese. The cockpit is armoured and fully air-conditioned.
E: two General Electric J85-GE-13A, 4,080lb turbojets with side-by-side thrust. **A:** two 30mm cannon and 4000lb of ordnance. **S:** 690mph at sea level. **CR:** 466m. **L:** 38' **W:** 30'

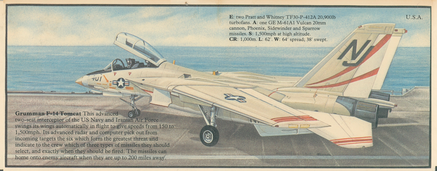


British Aerospace Lightning Mk6 A single-seat interceptor famous for its performance, with a rate of climb of 50,000 feet per minute. It had an unusual specification for its time, with a 60° wing sweepback, two engines mounted on top of each other inside the fuselage, and an all-moving tailplane. It was the RAF's first Mach 2 combat aircraft. By the time they are withdrawn in the early 1980s they will have been in service for 20 years. Overwing auxiliary fuel-tanks can be fitted for extended range.
E: two Rolls-Royce RB 146 Avon 302-C 16,300lb turbofans. **A:** a wide variety of guns, bombs and rockets. **S:** 1,500mph. **L:** 55' **W:** 35'

Dassault Mirage 2 An export version of the Mirage IIIE, delivered from 1968 onwards, with simplified aviation electronics. It was also developed for easier maintenance, and for operating out of remote and unprepared air-strips. Primarily a ground-attack aircraft, it can also be used as an interceptor, having two 30mm cannon and four infra-red guided air-to-air missiles. They have sold to Pakistan, Peru, Colombia, Belgium, Libya and other countries. The successful Israeli *Kfir* is based on the Mirage V.
E: one Snecma Atar 9C 13,670lb turbojet. **A:** varies, but for ground-attack is two 30mm cannon, plus two 1000lb bombs. **S:** 1,450mph, at sea level 863mph. **CR:** 800m. **L:** 51' **W:** 27'

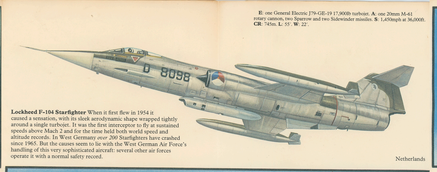


Dassault Mirage F1 This can be distinguished from other Mirages by its swept, not delta, wings. It was developed as a more manoeuvrable successor to the Mirage III. The first deliveries were in early 1973, and the Mirage F1 is in service with seven nations. Primarily an interceptor as a high-altitude interceptor, it has also been developed for ground-attack and training. It has been sold widely abroad: Spain, Greece, Kuwait, South Africa and Libya are now all using the F1 in its various versions.
E: one Snecma Atar 9K-50 15,785lb turbojet. **A:** two 30mm cannon and four missiles or fourteen 250lb bombs. **S:** 1,450mph at 40,000ft. **CR:** 560m. **L:** 49' **W:** 27'



Grumman F-14 Tomcat This advanced, two-seat, all-weather fighter for US Navy and Iranian Air Force pivots its wings automatically in flight between 20 sweep positions, from 20 degrees to full sweep. It has variable-geometry engine intakes, and can operate at speeds in excess of Mach 2. Its sophisticated weapon-aiming system should detect, and destroy, any target that should be there. The missiles can home onto enemy aircraft when they are up to 200 miles away.
E: two General Electric TF30-GE-412A 20,900lb turbofans. **A:** one GE M-61A1 Vulcan 20mm cannon, Phoenix, Sidewinder and Sparrow air-to-air missiles, and bombs or attack rockets. **CR:** 1,000m. **L:** 62' **W:** 64' spread, 38' swept.

British Aerospace (Hawker Siddeley) Buccaneer Buccaneers were originally developed in 1963 for operating off carriers. They were built unusually strongly to withstand the intense buffeting of operations at low level and heavy landings onto aircraft carriers cruising in rough waters. But with the phasing out of carriers they were modified and handed over to the RAF for land operations. The RAF has used them in the strike role, as a reconnaissance and maritime reconnaissance aircraft, able to penetrate enemy defences at extremely low level. The Royal Navy is now replacing Buccaneers with the vertical take-off Sea Harrier.
E: two Rolls-Royce Spey 101 11,000lb thrust turbofans. **A:** 16,000lb of ordnance, including bombs and Martel guided missiles. **S:** 645mph at 250ft. **CR:** 1,150m. **L:** 63' **S:** 44'.

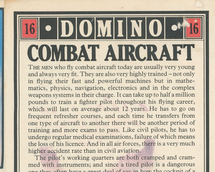


Lockheed F-104 Starfighter When it first flew in 1954 it aroused a sensation, with its sleek aerodynamic shape wrapped tightly around a single turbojet. It was the first interceptor to fly at sustained speeds above Mach 2, and in 1958 it established several world altitude records. In West Germany over 200 Starfighters have crashed since 1965. But the causes seem to lie with the West German Air Force's handling of this very sophisticated aircraft: several other air forces operate it with a normal safety record.
E: one General Electric J79-GE-19 17,900lb turbojet. **A:** one 20mm M-61 rotary cannon, two Sparrow and two Sidewinder missiles. **S:** 1,450mph at 36,000ft. **CR:** 745m. **L:** 55' **W:** 22'

McDonnell F-101 Voodoo The Voodoo was originally developed in the 1950s as a long-range escort and penetration fighter. It was the heaviest single-seat fighter ever produced for the USAF. It has been used in the strike role, ranging up to 2,800 miles – thanks to fuel from fuselage tanks and three more carried under the fuselage. A two-seat version was adopted by the US Air Defense Command and the Canadian Armed Forces.
E: two Pratt and Whitney J57-P-13 or J57-P-55 14,500lb turbofans. **A:** three Falcon missiles, two Genie missiles, four 20mm cannon. **S:** 1,220mph at 40,000ft. **CR:** 750m. **L:** 67' **W:** 40'

Northrop F-5 In 1963 the US Defense Department chose the F-5 or 'Freedom Fighter' for delivery to a number of air forces under a Military Aid Programme. Several improved versions were produced and in 1972 one was again chosen against strong competition. This was the F-5E Tiger II, with a more powerful engine, an improved wing, and a new nose section instead of the 'coke bottle' fuel tanks. Over 1,000 Freedom Fighters were made in America, Canada and Spain, and Tiger IIs are being built in similar numbers. Altogether F-5s have been supplied to some 20 countries from Taiwan to Brazil.
(Tiger II) E: two General Electric J85-GE-21 5,000lb turbofans. **A:** two 20mm M-39 cannon, two Sidewinder missiles, and up to 7,000lb of ordnance. **S:** 1,050mph at 40,000ft. **CR:** 875m. **L:** 48' **W:** 27'

McDonnell Douglas F-18 Hornet America's newest strike fighter has been developed jointly by McDonnell Douglas and Northrop. Orders have been ordered by the US Navy to replace the F-4 Phantom and the A-7 Corsair and the first Hornet was rolled out of the factory in September 1978. The total cost of the development programme is expected to be in the region of $133 million, including work on the General Electric engine.
E: two General Electric F404-GE-400 16,000lb low-bypass turbofans. **A:** one 20mm cannon, Sidewinder and Sparrow missiles, and bombs or other stores on nine pylons. **S:** 1,320mph to be around 1,040mph, just under Mach 2. **CR:** 300m approx. **L:** 56' **W:** 37'



Panavia Tornado At great expense, Britain, West Germany and Italy have jointly developed this swing-wing two-seat fighter for a variety of roles from battlefield strike to interception and reconnaissance. Production has been set up in each of the partner countries and 800 aircraft will be made to start with, the first going into service in early 1980s. The RAF is having a special interceptor version tailored for defence of the British Isles.
E: two turbo-Union RB 199-34R-2 14,500lb turbofans. **A:** two 27mm Mauser cannon and missiles, plus bombs. **S:** 1,520 mph at 36,000ft. **CR:** 870m. **L:** 54' **W:** 45' spread, 28' swept.

Boeing B52 Stratofortress The menacing shape of the B52 has been in the sky since 1955 and was for many years America's main nuclear bomber. As long ago as 1962, one flew 12,519 miles non-stop in 22 hours 10 minutes without refuelling, to establish 11 aviation records. Many changes have been made to its ability to carry stand-off weapons (missiles which can be launched in mid-air and directed to their targets) under the wings, and a tail-gun defensive gun system in the tail. It has a crew of six.
E: eight Pratt and Whitney J57-P-43W 11,200lb turbojets. **A:** four 1" defensive guns, two stand-off missiles, up to 60,000lb of bombs. **S:** 640mph at 20,000ft. **CR:** 8,800m. **L:** 158' **W:** 185'

Fairchild A-10A This extraordinary aircraft is in effect a flying bowtrizer – a plane built around a formidable cannon with seven barrels and an amazing rate of fire. It can fire either 2,100 or 4,200 rounds per minute, as the pilot selects. It was developed specifically as a tank-buster, and for loitering over battlefields. Hence the low top-speed and heavily armoured construction: it is built to withstand a great deal of punishment from anti-aircraft fire and still fly. It was selected in a 'fly-off' competition against an entry from Northrop, and the USAF are taking 773.
E: two General Electric TF34-GE-100 9,000lb turbofans. **A:** one General Electric GAU-8/A 30mm cannon and 16,000lb of ordnance. **S:** 450mph at 5,000ft. **CR:** 260m. **L:** 53' **W:** 57'

British Aerospace (Hawker Siddeley) Harrier The world's first vertical take-off fighter, Harriers can take off from the middle of a wood. Swivelling nozzles can direct the blast of its jet engine downwards. To help its performance even further a ski-slope ramp has recently been introduced 20 feet high and 130 feet long which 'throws' the aircraft into the air. British Aerospace are developing a version called the Sea Harrier for use off the Royal Navy's new through-deck cruisers, the first of these five in summer 1978.
E: one Pratt and Whitney F402-RR-406 21,500lb vectored-thrust engine, delivering 15,000lb. **A:** four 30mm cannon pods, or bombs, or rockets, or Sidewinder missiles. **S:** 660mph at sea level. **CR:** 280m. **L:** 46' **W:** 25'

McDonnell Douglas F-15 Eagle A handsome, expensive, high performance single-seater, one of a new generation of American fighters born in the 1970s. Lightweight, very fast and manoeuvrable, it is a formidable air-superiority machine. The US Air Force are taking over 700 and 23 have been sold to Israel. The range can be stretched to 3,450 miles using 'clip-on' auxiliary tanks. There is also a two-seater version, the TF-15A.
E: two Pratt and Whitney F100-PW-100 25,000lb turbofans. **A:** one 20mm M-61A-1 rotary cannon, four Sidewinder and four Sparrow missiles, up to 12,000lb of ordnance. **S:** 1,650mph. **CR:** 1,000m. **L:** 64' **W:** 43'

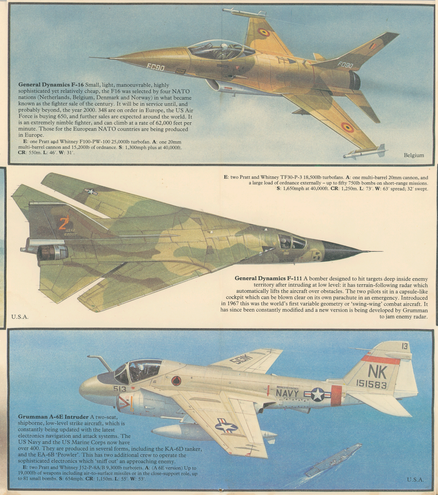
McDonnell Douglas F-4 Phantom II One of the most successful military aircraft ever, around 5,000 Phantoms have now been sold to forces all over the world. 128 were built in Japan. The Phantom is a very powerful, rather ugly, two-seater and is equally at home as a land-based or carrier-borne aircraft. Those bought for the RAF and the Royal Navy were re-engined with Rolls-Royce Spey engines. The RN have now handed their Phantoms over to the RAF, with the phasing out of British aircraft carriers.
E: two General Electric J79-GE-17 17,900lb turbojets (different engine types are used in other models). **A:** Varies widely, but can include up to ten missiles and a 20mm rotary cannon. **S:** 1,550mph at 40,000ft. **CR:** 1,000m. **L:** 63' **W:** 38'

Saab 105 Draken The 105 is the export version of the basic Draken (meaning Dragon) – a single-seat interceptor fighter. It was developed to intercept bombers at around the speed of sound and is fitted with advanced radar to enable it to do this in all weather conditions. But it can also be used for battlefield attack and for photographic reconnaissance. The original Draken prototype was flown in 1961, with first deliveries to the Swedish Air Force in 1965. The 105 has also been ordered by Finland.
E: one Swedish version of the Rolls-Royce RB 146 Mark 60 Avon 17,260lb turbofan. **A:** two 30mm Aden cannon and up to 8,000lb or ordnance. **S:** 1,200mph at high altitude. **CR:** 595m. **L:** 50' **W:** 30'

Saab 37 Viggen This powerful-looking Swedish single-seat, multi-purpose fighter – the Draken's successor, and in service with the Swedish Air Force since 1971 – has the unusual feature of a canard, or foreplane wing, giving it high manoeuvrability at high speeds. It also enables the aircraft to take-off and land on an unusually short length of runway. Finally, it has the ability to 'jump-off' and be directed by ground controllers to 'Dispersed Operations' – operating on service points beneath the wings and foreign. It can be equipped to fulfil four roles – attack, interception, reconnaissance and training.
E: one Swedish version of the Pratt and Whitney JT8D-32 26,015lb turbofan. **A:** one 30mm Oerlikon cannon and a wide variety of missiles, bombs and rockets. **S:** 1,320mph at high altitude. **CR:** about 4,015m. **L:** 58' **W:** 34'

Dassault-Breguet Super Etendard A single-seat strike fighter designed for use aboard French aircraft carriers. It was developed from the Etendard IV-M, which had served with the French Navy from 1962. It has an advanced ability to carry modern radar, a powerful and accurate navigation/attack system, and can be refuelled in flight. It first flew in October 1974.
E: one Snecma Atar 8K-50 11,025lb turbojet. **A:** two 30mm cannon and a variety of bombs and missiles. **S:** 745mph at sea level. **CR:** 225m. **L:** 47' **W:** 31'

Dassault-Mirage III This very successful aircraft was designed originally as a high-flying, all-weather interceptor capable of speeds of up to Mach 2.5. But it has since been developed into a number of other versions, including ground-support, long-range fighter-bomber, and reconnaissance. Over 1,000 of them are in service, some of them under licence. The Mirage III was the main fighter of the French Air Force through the 1960s.
E: one Snecma Atar 9c 13,670lb turbojet. **A:** two 30mm cannon and 4260lb of ordnance. **S:** 1,850mph at 39,000ft. **CR:** 745m. **L:** 49' **W:** 27'



General Dynamics F-16 Small, light, manoeuvrable, highly sophisticated yet relatively cheap, the F16 was selected by four NATO nations (Netherlands, Belgium, Denmark and Norway) in what became known as the fighter sale of the century. It will be in service until, and beyond, the end of the 1980s. It has already been ordered by the US Air Force is buying 650, and further sales are expected. Like the world's first is an extremely nimble fighter, and can climb at a rate of 62,000 feet per minute. Those for the European NATO countries are being produced in Europe.
E: one Pratt and Whitney F100-PW-100 25,000lb turbofan. **A:** one 20mm multi-barrel cannon and 15,200lb of ordnance. **S:** 1,300mph plus at 40,000ft. **CR:** 850m. **L:** 46' **W:** 31'

British Aerospace (Hawker Siddeley) Hunter In its time an outstanding and versatile fighter, selling to air forces all over the world. The RAF disbanded its two Hunter squadrons in 1971, but retained it as a trainer, and British Aerospace has found a trade with former Hunters and resselling them abroad. In the 1950s and 1960s they were used by the RAF's aerobatic team, and have always been a favourite of pilots who had the chance to fly them.
E: one Rolls-Royce Avon 207 10,000lb thrust turbojet. **A:** four Aden guns and a wide variety of weapons on wing pylons. **S:** 710mph at sea level. **CR:** 350m. **L:** 46' **W:** 34'

McDonnell Douglas A-4N Skyhawk A single-seat light attack aircraft which has proved a success in the 1960s and 1970s and now operated in an improved form by the US Marine Corps, Israel and Kuwait, Singapore, Argentina, Australia and New Zealand. The new version, which first flew in 1972, has a revised cockpit layout and updated navigation/attack electronics, and the distinctive 'hump-back'.
E: one Pratt and Whitney J52-P-408A 11,200lb turbojet. **A:** two 30mm DEFA cannon and 8,200lb of ordnance on hard points on the wing and fuselage. **S:** 685mph at sea level. **CR:** 335m. **L:** 40' **W:** 27'

SEPECAT Jaguar A single-seat tactical strike fighter developed jointly by Dassault-Breguet in France and British Aerospace, with assembly lines in both countries. The first French Air Force and RAF squadrons were both formed in 1973 and each country is buying 200. Both British plane has the more advanced avionics and thus is more expensive. An export version has been developed and has already been bought by Oman and Ecuador. India is also buying up to 200 Jaguars and will establish a production line of its own.

Dassault Mirage 2000 The new delta-wing Mirage, chosen as the future combat aircraft for the French air force. It made its first public appearance at the 1978 Farnborough Air Show, with an impressive flying performance. Top speed will probably be around Mach 2.2 and the first of the new aircraft are to be released, and it will enter service in the early 1980s.

Painted by Michael Trim – text by Arthur Reed
Devised and produced by Domino Books Ltd.
First published by Fontana Books Ltd. 1979
ISBN 0 00 685456 7
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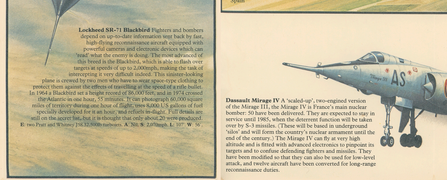

Lockheed SR-71 Blackbird fighters and bombers depend on up-to-date information kept back by fast, high-flying reconnaissance aircraft equipped with powerful cameras and electronic devices which can 'read' what the enemy is doing. The most advanced of this breed is the Blackbird, which is able to radio over targets at speeds of up to 2,000mph, making the task of interception very difficult indeed. The pilot of the plane is crewed by two men who have to wear space-type clothing to protect them against the effects of travelling at the speed of a rifle bullet. In 1964 a Blackbird set a height record of 80,000 feet, and in 1974 crossed the Atlantic in one hour, 55 minutes. It can photograph 80,000 square miles of territory during one hour of flight. Uses 8,000 US gallons of fuel specially developed for it an hour, and refuels in-flight. Full details are still on this secret plane, but it is thought that only about 20 were produced.
E: two Pratt and Whitney J58-22,900lb turbofans. **A:** None. **S:** 2,070mph. **L:** 107' **W:** 56'

Dassault Mirage IV A 'scaled-up', two-engined version of the Mirage III, the Mirage IV is France's main nuclear bomber. 50 have been delivered. They are expected to stay in service until 1985, when the deterrent function will be taken over by S-3 missiles. (These will be based in underground 'silos' and will form the country's nuclear armament until the end of the century.) The Mirage IV can fly at very high altitudes, and can also be used for reconnaissance missions as targets and to confuse defending fighters and missiles. They have been modified so that they can also be used for low-level attack, and twelve aircraft have been converted for long-range reconnaissance duties.
E: two Snecma Atar 09K 13,400lb turbojets. **A:** atomic or 'iron' bombs, or Martel anti-radar missiles. **S:** 1,450mph at 36,000ft. **CR:** 750m. **L:** 77' **W:** 39'

Grumman A-6E Intruder A two-seat, daylight/one, low-level strike aircraft, which is constantly being updated with the latest electronics navigation and attack systems. The US Navy and the US Marine Corps now have over 400. They are produced in several forms, including the KA-6D tanker, and the EA-6B 'Prowler'. This has two additional crew to operate the sophisticated electronics which 'scuff out' an approaching enemy.
E: two Pratt and Whitney J52-P-8A/B 9,300lb turbojets. **A:** (A-6E version) Up to 18,000lb of ordnance, including Harpoon and Shrike close-support stop up to 30 small bombs. **S:** 636mph. **CR:** 1,019m. **L:** 53' **W:** 53'

LTV A-7E Corsair 11 Subsonic single-seat tactical fighters, Corsairs are in service with the US Air Force, the US Navy and the Greek Air Force. During the Vietnam war they operated off US aircraft carriers sailing near the coast. Several versions have been produced, the latest being this A-7E, of which 700 have been ordered by the US Navy.
E: one Allison TF41-2 turbofan (based on the Rolls-Royce Spey) 15,000lb thrust. **A:** one 20mm M-61A-1 rotary cannon and 15,000lb of ordnance. **S:** 690mph at sea level. **CR:** 700m. **L:** 46' **W:** 39'

Mikoyan Mig 21 The Soviet Mig-21 (NATO code 'Fishbed-K') is the standard fighter around Finland, Egypt and India (where a version is built under licence) as well as by the USSR and many of her allies. It is one of the most successful fighter planes ever designed: small, lightweight and simple yet with outstanding speed and manoeuvrability. It held the world records for speed and height in 1962, and the Vietnam War was able even to outmanoeuvre Sidewinder missiles. Since its introduction it has been continually developed to improve its performance and armament.
E: one Tumansky R13 14,550lb thrust turbojet. **A:** two 30mm cannon and two Atoll missiles, plus bombs or rockets. **S:** 1,450mph at 36,000ft. **CR:** 350m. **L:** 52' **W:** 23'

U.K. 85p

ISBN 0 00 685456 7